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PSYCHOLOGY AND SCIENTIFIC METHODS

THE PSYCHOLOGY OF 'ETERNAL TRUTHS'

ETERNAL truths, the goal of philosopher and visionary, are having a hard time of it, nowadays, with all the theories spun about them. These theories seem to have brought them down to the level of pure hypotheses, a social necessity or a personal convenience. Looking at the matter ultra-pragmatically one might be tempted to say that men have become so wearied of the pursuit after such truths that they feel a deep inner need of berating the elusive things, much as the fox criticized the grapes. For all this, there is still another line of approach which, so far as I know, has never been fairly pursued, and which, though plainly not leading directly to a solution of all the problems involved, nevertheless seems to take us to a point where certain fundamental descriptions are easy and sure. I refer here to the investigation of our immediate experiences of the meanings expressed in the so-called eternal truths. In particular we must first be interested not in the truthfulness of these meanings, but rather in their supposed eternal character. For empiricists the experience of a truth does not offer so many profound perplexities as the experience of its eternal character. Believing firmly that every meaning has a concrete basis in immediate experience, one naturally wonders how we can ever experience eternality, even representatively. It will prove highly instructive, I am sure, if we can make this point clear without resorting to mystical notions about 'social necessity,' 'heart-hunger for the eternal,' and the like which pervade so much current literature with their hazy glamor.

The fact that we mean something when we hear or use the adjective 'eternal' I take to be absolute evidence for the further fact that there is some typical experience here involved and awaiting empirical description. This description must be rendered before the nature of eternal truths or 'objectively valid propositions' can be expatiated upon. For it is a commonplace of psychology to-day that time is only an experience-quality, just as space, light, feeling, etc., are, so that whoever qualifies anything as 'eternal' is deliberately bringing it into connection with a certain experience-quality.

The empiricist wants to know precisely what all this *means* before he attempts to champion or condemn; furthermore, he is impatient with all harangues basing upon the dreadful consequences of doubting eternal truths, so long as these latter have not yet been given an unequivocal significance that can be verified by anybody.

At the outset it is clear that, in experiencing the meanings we come to call true, this trueness is not a part of any such meaning itself, but rather a qualification reflectively added to the meaning as a whole for some reason or other. I assume that everybody recognizes the *a posteriori,* 'external' character of all worth-qualities. As James says, no 'click in our mental machinery' labels meanings true or false, real or unreal, as they pop up into mental view. It now behooves us to inquire whether the quality of 'eternality' is given or derived, a peculiarity of immediate experience or one of reflective constructions. An overwhelming verdict in favor of the latter view is handed down by philosophers and psychologists alike, all agreeing that it is a stupid *contradictio in adjecto* to speak of experiencing all times in one present moment. Even those who find certain difficulties in this answer do no more than to say that the present experience contains phases which represent or function for all other time-experiences. The numerous types of such interpretation can not even be named here; only this must be noted, that in almost every such interpretation the time-qualification is reflectively added in the same general way that the validity-qualification is, thus leaving us to conclude that the meaning 'eternal' is joined to the 'true' meaning *on the ground of something else,* this something else being presumably a worth of some sort. This seems to be, in rough, the idea recently developed by Royce.[1]

Space forbids here every criticism of the philosophy of eternal truths, but I would suggest that our theorists make a sharper distinction between the eternal and the timeless, two concepts which, though often enough marked off from each other by thinkers, tend constantly to run together. Psychologically the eternal is intricately connected with duration; it means unlimited duration in every conceivable connection of thought. To speak of truths as eternal is to assert that certain worths endure forever, a proposition to which all empiricists with one accord must take exception in so far as they find themselves compelled to treat the statement as unproved and probably unprovable. But, on the other hand, the timeless is merely

[1] 'The Eternal and the Practical,' *Philosophical Review,* Vol. XIII., pp. 113 ff. To my mind, the attempt to turn what is primarily a time-quality into nothing more than a value is rather adventurous, because it confuses psychological description with philosophical interpretation, and thus invites all sorts of semireligious notions into the fold of scientific thinking.

that which has nothing to do with time, whether duration, simple change or succession. And this concept has a psychological basis utterly different from that of eternality, as I shall now try to show.

Turning to any experience moment, we find an aggregate of primitive qualities—or better, simple meanings—forming a vague totality bound together by little more than its own 'now-ness' or 'given-ness.' So far as our ability to describe them goes, the differences between these meanings are quite as primitive as the meanings themselves. At least it is sure that, even if their differences are not 'given' in quite the same way the meanings themselves are, this does not contrive to make these latter alike; a color is not a sound, even when their difference has not yet been apperceived. Now, among the primitive meanings we find duration, simple change and succession, each a perfectly distinct character, however much it may be involved with others. Moreover, a confusion of red with change, or of sweet with duration is, at least for all modern-day experience, impossible; nor does this impossibility base solely upon the verbal definition of the qualities in question, but rather upon the character of the experiences themselves. The difference is not a matter of degree, as some metaphysicians would like to have it; when I say that duration has no color, I mean something totally different from what I would in saying that a man's face is colorless. When I say that change does not taste, I do not mean that it is tasteless as boiled water is, *i. e.*, that its taste is practically a negligible quality. In the same way, though less clearly perhaps, the duration of an experience-moment wherein we experience a color is not a quality of the color, but only a dependent phase in the mental act. As Stumpf's classical monograph on space-perception and, more recently, Husserl's development of logical descriptions, have well shown, the independent *variables* in an experience-complex may depend for their empirical existence upon other phases in the complex, and yet not be properly qualified by these. Variations in color are independent of spatial and temporal variations, and so on. We have, then, meanings of the sensational order which are timeless in the strictest sense of this word.[2]

[2] It may be said that beyond certain limits a color is modified by its extension; that the succession of one and the same beat, if rapid enough, transforms the beat into a tone, and so on. These facts, however, are so highly complicated that I must forbear explaining them here. Enough to say that in all such cases we do not have a variation in the mere time-quality alone, but what is most significant, a *parallel* variation in color, sound or the like. There is no sort of causal connection here; it being impossible to think of the time-variation as preceding the other ones in time. This hint may be useful in warning us away from the most serious of the many possible misinterpretations.

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The second point to note is the commonest phenomenon of mental life, namely, the transfer of meanings from one aggregate to another. This is what is called reproduction, or in certain cases memory. Meanings here break loose from their original setting wherein they are implicated with a time-element (a 'Now'); they function in wholly new combinations involving new time-elements. Now the fact that I can now compare a red seen yesterday with a red I now see without involving thereby a comparison of the time-qualities, strikes me as very simple and binding evidence of the independence of color-qualities in a new sense whose significance has possibly been over-neglected. Not only is red something totally different from duration as simple quality (or 'pure' experience), but its persistence in mental life is not colored by any temporal qualities in connection with which it may have occurred. The red I saw a year ago *means* something to me which has not been undergoing a change *in meaning* ever since I first saw it; and when the psychologist opposes this with the remark that we all do forget and confuse past experience-qualities, we must reply that forgetting such qualities is not the same as changing them, and that every confusion can be verified only because somebody is able to compare past with present. Even in those cases where a genuine confusion occurs, however, it is not the time-quality of either term which has anything to do with the confusion; it is a confusion of many terms so nearly alike that the phenomena of least perceptible difference and attention play a weighty rôle.

All this, of course, does not hinder us from admitting that meanings can be 'dated,' *i. e.*, recognized as having occurred in another experience-complex than the one colored with the present 'Now.' For, as we shall soon have occasion to emphasize, experience-complexes of nearly all sorts persist unaffected by time-qualities precisely as the simplest colors, tones, tastes, etc., do. Thus we have the peculiar but by no means mystical phenomenon of the independent persistence of part-meanings and of group-meanings composed organically of these same part-meanings. There is a whole world of intricacies wrapped up in this general fact, a world full of work for psychologist and logician alike. Here, however, we must be content with the widest generalization alone, which bases directly upon the multirelativity of pure experience-parts, which James has described in outline.[3]

[3] Perhaps some occasion will arise where I may show how the deep truth of James's theory needs restatement in order to be ready for the philosophical fray. The distinction between experiences and pure experiences, as well as the description of present experiences as 'representing' or 'knowing' past ones, can not help leading to the gravest misinterpretations, as the criticisms advanced at the recent Psychological Congress at Rome can testify.

The other than temporal relations in which any meaning stands depend wholly upon the particular character of the meaning itself, the meaning to which it is related, and what may generally be called the relating 'medium' or the other meanings necessarily involved in the construction of the relational one. Thus the relation of tones in a harmony depends upon the intervals (not temporal) and the individual tone-qualities. The fact that a wholly different complex-effect is gained by introducing temporal differentia, thus producing a simple melody, in no wise affects what we have said, but simply shows that time-elements may sometimes be 'parts' of an experience-complex. It would be ridiculous to say that the experience we call a harmony is 'qualified' by the simultaneity of its elements and, therefore, is a temporal experience in the sense here under discussion. For all we thus far maintain is that the harmony-meaning is not a time-meaning, and that further it can be shifted, *as a meaning*, from one complex to another without affecting its significant identity. What makes the harmony, as we experience it directly, is not the simultaneity of its parts in the sense that the succession of the parts of a melody makes up this latter. In the former case the so-called time-quality does not 'belong' to the harmoniousness, while in the latter instance we feel the intervals and successions out and out as *being* melodious.

What now of those experiences containing meanings which in retrospect are called eternal truths? Is it all a matter of reflection? Plainly not. Whenever I experience the binomial theorem meaningfully; that is, whenever I understand what is meant by the term, I may describe my experience as above. First, I experience no duration. The duration 'of the moment' is, of course, quite real, but, as a logician would say, irrelevant; that is, it is another meaning, just as taste is not sound or a triangle not a vertigo. Secondly, the meaning 'binomial theorem' may persist in my thinking, *i. e.*, through an indefinite number of experience-complexes involving different time-qualities, and not change in the least. Thus yesterday I may have experienced 'the binomial theorem is hard to learn'; to-day, 'the binomial theorem is the basis of all higher algebraic operations'; and to-morrow, 'I've forgotten the confounded binomial theorem.' In each case I experience the same unitary meaning; even in experiencing that I have forgotten it, I am experiencing it just as psychologically as ever, save that I am now unable to use it in the way for which it is fitted by its own peculiar character. And, lastly, the binomial theorem has no time-factors as internal organic constituents; its a's and b's and equalities are not historically located so that their dates determine in any way the meaning of the complex.

That all this can be said of logical propositions may be seen upon simple trial. As a mere description of our experiences of the meanings the three distinct types of timelessness are beyond dispute. But they afford us absolutely no clue to the way whereby men come to call certain meanings true and others false, some fleeting and some invariable. Just because of their inability to do this they have been neglected by humanists far more than is justified by the philosophical situation of our times. It is perfectly true that the sort of timelessness above described is found even in senseless and absurd meanings. And it is further true that nobody can *know* that the thing thought of an hour ago is now being thought of in such a way that there is absolutely no difference in its meaning-organization involved in the repetition.

There is no need to shilly-shally about this fundamental solipsism; the escape does not lie in fancy theories explaining the fact away, but rather in a frank acceptance both of it and of the practical way we overcome its theoretical disadvantages. We do gain the mastery over our world of meanings by the simple device of meaning the something and trusting to its own efficiency to carry us through. Even in the course of a simple argument I have no means of demonstrating that the man Smith I had in mind at the outset is even functionally the same as the one of which I now talk. Indeed, any demonstration would merely assume what it seeks to prove. But at every point in the same argument I do *refer* with full awaredness to the same identical meaning (unless I am a sophist or other intellectual conjurer). I *mean* by the man Smith absolutely the same individual that I meant three sentences back; and about this intentional reference there can be no more doubt than there can be about the red I now sense or the warmth I feel. The humanistic contention that this identity of meaning gains its sole 'verification' in its practical results can not be challenged. But it is clear that even the most practical results are meanings in the ideal sense, so that the whole tale must be retold of them too. When I call a thing practical or true, unless it be that its full practicability is being simultaneously experienced, I am making the same reference, immediate and undemonstrably valid; so that, after all, *the ultimate practicability of anything is its ability to be referred to as an identical meaning.* Upon this every other utility rests. If the thing or quality or meaning of other sort be incapable of persisting as identical, breaking loose from its warm setting of sense and entering into colder groups, then it is not only useless, but for all practical purposes non-existent. To paraphrase a brilliant thought of Janet's, however keen the sensual or intellectual pleasure of an experience

might be, if, after its brief sensational existence I could not even *refer* to it, it might as well have been a pang of bitterest sorrow. This identity of meaning is, however, given me as really as anything can be. It is quite immaterial whether or not the psychological processes vary with the recall, whether the memory-image is each time a new one or not; so long as the true thought-object is the one referred to, there is some hope that I can turn it to account. Otherwise neither absolutist nor humanist can say anything about it. So, after all, the mere psychological timelessness of meanings, either as genuine recurrents or as objects of reference (ideal, assumed recurrents), is the point of departure for every logical theory and not the goal of the visionary. What we are all looking for in active life, however, is not non-temporal meanings, but rather ones that will wear well. And neither logic nor psychology has the monopoly on these.

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THE IDEAS AND TERMS OF MODERN PHILOSOPHICAL ANATOMY.[1]

THE ideas of philosophical anatomy have been developed during three periods of human thought: First, the Greek, in which adaptation was clearly perceived as the central phenomenon of life, in its morphological and physiological expression. Second, the pre-Darwinian period, in which the idea of the environmental relations was developed especially by Bacon; and various forms of morphological, physiological and especially psychical adaptation were developed gradually through the studies of Buffon, Lamarck, Geoffroy St. Hilaire and more especially Goethe; adaptations began to be distinguished broadly into *primary,* or those which had been of use in past time, and *secondary,* or those which were recent in origin and in full use at the present time. Even prior to these writers, however, Vesalius in his studies of human anatomy perceived the importance of this distinction. Philosophical anatomy really owes to Darwin himself the fundamental ideas which are involved in the terms primitive, retrogressive, progressive and dominant, and are understood with increasing clearness. This is the third period of anatomy as established on evolution. Huxley in his brilliant essay of 1880 on 'The Laws of Evolution as Applied to the Mammalia' was the first to emphasize persistent primitive characters and modernized or adaptive characters, laying great stress on the importance of the former in questions of phylogeny. Among many

[1] Presented before the New York Academy of Sciences, April 10, 1905.

other anatomical papers E. Ray Lankester's 'Degeneration, a Chapter in Darwinism,' brought out especially the significance of retrogressive changes.

Huxley was a master of logic, but even his keen vision failed to recognize the vast importance of the element of analogy, or similarity of function, in bringing about a similarity of structure in evolution independently of real similarity of kinship. This final phase in anatomical analysis is largely due to the broad extension of paleontology, and the demonstration over and over again in nature that similar forms have been produced independently either by parallelism from animals related in ancestry, or by convergence in animals unrelated in ancestry. To these processes and results of similar modeling Lankester has applied the fitting 'terms homoplasy' and 'homoplastic.'

Explanation of the Table.

In the Table an attempt is made, for the first time to my knowledge, to bring together all these processes of change and to indicate their interrelations. There can be little disagreement as to the terms in columns I., II., III., but some surprise may be felt as to the broad inclusiveness of column IV. The justification for this column lies in the fact that in the analysis of any animal form the questions which each anatomist should put to himself as regards each character are: Is this a primitive or a secondary character? If primitive, is it in a balanced or stationary condition, or is it in process of change? Secondly, is this a retrogressive or a progressive character? Questions to be answered certainly only by the evidence afforded by ontogeny or paleontology, and in a comparatively limited number of cases by comparative anatomy. Further, it may be necessary to ask: Is this a dominant character, or one which has attained such importance in evolution as to crowd out and overshadow all others?

Anatomical analysis, however, does not stop here; we must constantly be on the lookout for transitional characters or characters in the very act of change. These transitional or evolutional characters appear at present to be of four kinds: first, *modifications,* or such as have been brought about during the life of the individual without necessarily being connected with germinal changes; second, *fluctuations,* or fluctuating variations, changes of degree or proportion which may be due either to somatic or to germinal causes, one of the most difficult problems in regard to fluctuations being to ascertain how much is germinal and how much is purely somatic; third, *saltations,* which are altogether germinal, or at least prenatal,

THE IDEAS AND TERMS OF PHILOSOPHICAL ANATOMY.

I.	II.	III. COMPARISON.	IV. COMPARISON.	V. COMPARISON.
Life is the continuous adjustment of internal and external factors and processes. Adaptation is of the broadest character and relations, internal and external, including:		In every animal adaptations of the past, present and future mingle, and may be broadly distinguished into:	As Regards Present Time. Animal and plant types, organs and functions are accordingly found in all grades of development and adaptiveness, with reference to past, present and future activity.	As Regards Origin. The results of adaptation in different animals and plants are also comparative, *i. e.*, similar, or dissimilar, according to the operation of similar internal (*i. e.*, hereditary) and environmental conditions.
Environmental or Bionomic, *i. e.*, in relation to physical and living surroundings, to geologic, geographic, physiographic, meteorologic, faunal and floral conditions or changes. Morphological or Anatomical, *i. e.*, structural, in organs, direct or correlated. Physiological or Functional, *i. e.*, in habits and uses of organs. Psychical and Neurological, in the brain, nervous system, and psychic life generally, imitations, instincts, intelligence.	ADAPTATION AND ADAPTABILITY.	Peimary or Primitive.	1. *Primitive.* 'Persistent primitive,' or arrested types, organs and structures which continue to be useful although perhaps of very great antiquity, in a balanced or stationary, also 'progressive' or 'retrogressive' condition.	I. Homologous, *i. e.*, *Homogenous.* II. Analogous. *Parallel.* Analogous adaptations, *i. e.*, similar characters arising independently in *similar or related animals or organs*, causing a similar evolution, and resulting in parallelisms. *Convergent.* Similar adaptations arising independently in *dissimilar or unrelated animals or organs*, causing a secondary similarity or approximation of type, resulting in *convergence.* III. Non-Analogous. *Divergent.* Increasing specialization and differentiation resulting in 'divergence' or 'adaptive radiation.'
		Transitional.	1. *Modifications.* Somatic and in part germinal changes, environmental, also use and disuse. 2. *Fluctuations.* Exclusively germinal, fluctuating changes of degree, continuous. 3. *Saltations.* Germinal, marked changes of kind, sports, mutations of De Vries, discontinuous variations. 4. *Rectigradations.* Continuous germinal changes in a single direction, mutations of Waagen.	
		Secondary or Adaptive.	1. *Retrogressive.* Declining types, organs, habits and functions. Reduced, degenerating, partly functional, and functionless, passing through the stages of 'regressional,' 'vestigial,' 'variable,' 'atavistic,' or 'reversional' (according to certain percentages of occurrence) into 'recessive' (*i. e.*, very rarely reversional). 2. *Progressive.* Rising or developing types, habits, organs and functions. Rudimentary, prophetic or nascent organs and structures in the true sense of beginning, becoming sub-functional, then functional or fully useful. 3. *Dominant.* Organs, etc., attaining such importance as to overshadow all others, often leading to the extinction of the types through extreme specialization.	
	The collective phenomena of fitness and the evolution of fitness as the essential and distinctive feature of life.	Fitness in time, *i. e.*, in past time, in the present, and tending toward fitness in the future.	Grades or degrees of fitness as determined in *individuals* by direct study or comparison, in the sciences of anatomy, comparative anatomy, paleontology, embryology, in ontogeny, fœtal and larval life.	Fitness of certain groups or organs in comparison with *other groups* (*i. e.*, classes, orders, families, genera, species, varieties) as well as in comparison with organs and functions in other groups of animals.

in origin, including marked changes of kind, the 'sports' of Darwin and Galton, the 'discontinuous variations' of Bateson, and the 'mutations' of de Vries. Wide celebrity has been given to the word 'mutation' through the brilliant experiments and observations of de Vries, but the original significance of this term as employed by Waagen and Scott was a different one, and I think it probable that Waagen used it in the sense of determinate variation. Fourth, *rectigradations*, a new term with which I propose to characterize what in the year 1889 I described as 'definite variations'; it embraces changes which many writers have described as 'orthogenetic,' under the supposed law of direct change (usually in an adaptive direction), which is termed Orthogenesis; these probably are the 'mutations' of Waagen.

All the processes in column IV. are those which may be observed at the time or moment of observation in any organism, provided we have sufficient keenness of perception or sufficient knowledge to discriminate between them.

The elements of comparison given in column V., on the other hand, relate strictly to questions of origin, or to the past and the future, also to questions of comparison. The first broad distinction of comparison is between I., Homologous and, II., Analogous characters. In a strict interpretation homologous refers only to those elements which are 'homogenous' (Lankester), or have an actual similarity of origin or ancestry. Under analogous characters there is a simple distinction to be drawn between the results of parallelism and of convergence, terms which I maintain should be used in a somewhat stricter sense than they have been hitherto. Looking to the past and future we have III., the non-analogous characters and the broad phenomena of divergence. Appreciation of animal divergence, or of divergence in special structures and organs, naturally belongs to the evolutionary period of anatomical thought; a period beginning with the branching system of Lamarck and continued in the still clearer perception of divergence in the writings of Darwin. I have elsewhere proposed to employ the term 'adaptive radiation' for the general results of divergence as observed in a single group, distinguishing such a group in process of divergence as a 'radiation,' either a 'continental radiation' where diverging on a large scale, or a 'local radiation' where diverging in a more restricted environment.

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DISCUSSION

QUANTITY, QUALITY, AND THE FUNCTION OF KNOWLEDGE

IN the *Monist* for July are two articles which raise an issue of categories that appears to be crucial in current philosophic method and aim, so that if there be a quarrel brewing in the speculative world here should be its incipience.

I

Oddly enough, in 'Quality and Quantity,' by Johannes Gros, the fundamental contention is taken as settled. 'The human mind knows only number adequately.' 'The mind only grasps fully and clearly that which is reducible to the terms of ratio.' 'We reduce our impressions to particular mathematical formulas, and simply by means of this reduction of a confused state to a clear idea, we manage adequately to grasp the real.' 'Science . . . simply affirms that the mathematical expressions in which it sets reality are to us the only condition of any perfect intelligibility.'

I quote these scattered statements to show the nature of the assumption which the author evidently considers self-evident, as 'founded on a necessity of the human mind,' although he incidentally supports it by appeal to the history and ideals of exact science.

The problem which the discussion formally sets is the reduction, so far as may be, of the category of quality to that of quantity. Quality is analyzed as the expression of a relation between two terms—the self, as a series of conscious states, and the external world, as the register or measure against which the self descries its own serial nature. Subjectively the sensational series is incapable of possessing any definite character; it is only by dint of its objective reference that it can even know itself as a series. This objective reference is the created external world, which is a kind of mirror of the self; it is the sensation series externalized, and therein lies its qualitative nature. But such a world is a palpable hypostatization. Hence, quality in things is illusion due to the need for externalizing a cause for sensation; all it yields is confusion replicating the uncertainty of subjective sensation.

Now the problem of knowedge is to clarify this confusion. On the basis of the underlying assumption (that the mind 'knows only number adequately') this means mathematical formulation. Physics, in postulating and describing a world of sensation-causes, gives such formulation. 'Objectively and scientifically, the external object is

only our sensation measured in what we suppose to be its cause; it is the intensive expressed by the extensive.' What it amounts to is a kind of self-description with the subjective (confused) element eliminated. 'When we think that we are reducing external reality to a mathematical formula, it is nothing but ourselves that we are so reducing—ourselves rendering objective the product of our thought.'

The significant point is that we do this in the category of quantity, by measurement and equation. Science is an algebra of experience by means of which all that is meaningful is rescued from the inconstancy and turbidity of subjective sensation. Its numerical schematisms are the quantitative rendering of the series of qualitative haps that make up the first blush of life.

Hence: 'Quality, scientifically speaking, is a point of view relating to the exigencies of our body in its relation to external objects; it is in us the more or less confused feeling of something good or evil for our organism. Quantity is the irreducible point of view of thought in its effort to reflect and classify the world.'

II

The article in which the editor of the *Monist* replies to the foregoing can hardly be termed less than a brief for 'The Significance of Quality.' It is written with evident ardor and a will to vindicate. In behalf of the discredited category he makes a series of points: (1) That quality is a fact. (M. Gros denied only that it is a significant fact.) (2) That historically it plays an important rôle in the development of thought. (M. Gros but contends that the history of science tends to eliminate it.) (3) That after the last measurement is made there is still a residue of experience only to be described qualitatively; and indeed that qualitative classes play an important rôle in knowledge. Finally, (4) that the idea of unity is itself qualitative; 'a unitary complex is not merely a summation of its constituent parts; it contains a new factor which is not of a quantitative but of a qualitative nature, originating through the cooperation of its parts; and this new factor would not have been produced by any of its parts alone, but is the result of their mutual interaction.'

The two latter points are the ones of importance, and as the last explains and justifies the other, it alone need be considered. The gist of the interest lies in the fact that arrangement independent of quantity originates significance. Arrangement, the relation of part to part, is in fact the essence of quality; the nature of quality is 'always due to a definite configuration or structure, constituting a

higher unity endowed with new and characteristic features of its own, not contained in any one of its several parts.'[1] And here we have one of the radicals of knowledge; for life, evolution, the universe itself, can not be comprehended except under the guise of such a complex unity. With none whatever increase or diminution of matter or energy, the world may very well suffer loss or gain of value just by the rearrangement of its constituent parts. The mere need of inclusiveness in our conceptions fortifies the position of quality among the categories.

III

It is evident that there is here a somewhat sharp divergence in the conception of the function and possibilities of knowledge. M. Gros is convinced that the only valuable knowledge is clear knowledge and that the only clear knowledge is mathematical. Dr. Carus esteems any knowledge incomplete which does not lead to what I may call motivating conceptions, that is, to conceptions possessing an attractive or inspirational character. The category of quality is lightly or largely valued accordingly.

The real issue, then (an issue which I conceive to underlie many differences of current philosophic thought), is not one of categories, but of the proper rôle of the rational in the manifold of experience. If one's interests be mainly logical or practical, the quantitative formulation will strongly appeal; for it is not to be doubted that the summarizing and predictive operations of thought are immensely facilitated by such process. But if one's instincts be ethical or esthetic, then the more imaginative and inciting category of quality will represent the preeminent type of knowledge.

Is this antagonism final? There are considerations which answer negatively, perhaps readiest to be reached through a discussion of certain moot points in the articles resumed.

1. Foremost: Is the assumption of M. Gros, that clear knowledge

[1] Dr. Carus's definition of quality is certainly open to objection. For in what category are we to think the parts which enter into the structure or establish the unity? They are not quantities; they can not be measured by the unit—except the indefinite axiom that a whole exceeds its parts be a type of measurement. In any case, if the unit have more than a relational quality, if it be more than relation, its parts must share its character—in which circumstance the quality would be theirs. Moreover, it is not beyond dispute that simple qualities may both be thought and be real. Hobbes's dictum, *idem semper sentire et non sentire ad idem recidunt*, is not wholly credible from the standpoint of an outsider debating the presence or absence of reality. At least it would seem that an intelligence, turning over possibilities of creation, might hesitate to pronounce an exquisite, all-engrossing agony ethically the same as no experience at all.

is essentially quantitative and mathematical, a justified assumption? It looks very much as if analysis would reveal here the personal equation, and, what is worse, a *circulus in probando* at the basis of his argument. For while the goal of his reasoning is to show that the external, physical world is clearly known only in mathematical schemata, the special intelligibility of mathematics he refers invariably to its implied translation in extension; geometry, he evidently conceives, is the ultimate norm of clear thinking. In other words, the only clear knowledge is of external (spatial) relations because spatial relations only can be clearly known.

However, the formalities of the reasoning are not to be quarreled with if the intuition upon which it is based have good warrant, and as such warrant the author's appeal to history must certainly serve. Yet granting (at least as a right of individual intuition to affirm) that the geometer's are the clear ideas, the primacy of the category of quantity is not thereby conceded. For it is the fairest of questions to demand wherein the clarity of these ideas consists, whether in extension as such, or in extensive relations, or in number and limit, or again in the sensuous forms of intuition whereby we first know space. Now in Euclidean space, at all events, it appears to the writer that it is indubitably in the sensuous intuition that the clarity exists, and a nice indication of the truth of this interpretation is the fact that, although we have two senses, touch and sight, whereby we perceive space, we rely almost exclusively upon one, sight, for those finer measurements which yield our exact knowledge. Indeed, it has been cleverly noted that the history of physical science might almost be phrased as the progressive conquest of the domains of the other senses by vision. *'Le langage de la vision des formes est celui qui s'applique directement au plus grand nombre des faits extérieurs connus; on peut presque dire que le langage scientifique n'est autre chose que le langage optique et que nous n'avons une idée claire des phénomènes, que quand ils se traduisent pour nous en langage optique. Aussi allons-nous voir que l'histoire de l'empiètement progressif du canton optique sur les autres cantons sensoriels peut être considérée comme l'histoire du progrès de la science.'*[2]

Manifest as is the support here given to M. Gros's favor for the geometer's knowledge, no less manifest is the defeat of his claim that this knowledge is primarily quantitative. Mensuration is largely translation of the acquisitions of the less specialized into the forms of understanding of the more specialized sense. The clarity of extensive quantity is the clarity of visual sensation. And this is saying that quantitative knowledge is essentially but a uniquely

[2] F. Le Dantec, 'Les lois naturelles,' p. 37. Paris, 1904.

developed variety of qualitative knowledge, to which it refers for final intelligibility.

2. But extension does not exhaust the notion of quantity. Both time and gravity enter into many measurements, and, though the one may be recorded upon the dial of a clock and the other by the tilt of a steelyard, such translations are not invariable. Further, there are all sorts of complex relations inherent in number expression having no physical reference whatever.

If I may quote from the St. Louis address of Professor Royce:[3] "The idea of number, familiar as its applications are, does not derive its main value from the fact that eggs and dollars and star clusters can be counted, but rather from the fact that the idea of number has those relations to other fundamental ideas which recent logical theory has made prominent—relations, for instance, to the concept of order, to the theory of classes or collections of objects viewed in general, and to the metaphysical concept of the self."

Now in all of these various applications we get exact (that is, mathematical) knowledge which is by no means quantitative. Number itself, as mere counting, would appear ultimately to reduce to bare discrimination of *this* and *that*, to the primary abstraction of difference, which is certainly qualitative. A refinement of difference is limitation, which, with repetition, gives series and measurement, and here first we get true quantity, a greater and a less. But it is sufficiently obvious that even in measurement the qualitative reference is not escaped. The content of the unit, whether an etheric vibration, the beat of a metronome, or a bed of Procrustes, is what it is as determined by quality, and it is the content of the unit which gives the measurement significance.

In fine, the category of quantity is only a highly specialized development of quality, serving knowledge to peculiar advantage. All its embodiments partake of that individualism which is the earmark of quality. Triangularity is more than a special construction of straight lines and the golden section is more than a definite proportion. Indeed, mere direction derives its character from the ideal orientation of the body; thus, like measurement with its ideal repetitions, giving us knowledge by forming 'attachments' for foreign-seeming objects; that is, by imbuing them with familiar feeling-tones.

IV

Our conclusion, then, is that quantitative knowledge is a special case of qualitative, deriving its peculiar cogency from the capabilities and aptitudes of a particular sense, that of vision, or from relational ideas having a more or less direct reference to qualitative conceptions.

[3] 'The Sciences of the Ideal,' *Science*, October 7, 1904.

What follows from this is a generalization of some scope: the genesis of reason is to be sought in imagination; there may even be an eventual conformity of the ideals of these two faculties, an eventual identity of the true and the attractive.

Of course I would not wish to say that the mere fact of the genetic unity *necessarily* means the teleological unity of the mind's activities. But there are grounds for asserting that it *may* mean this. Human nature, with all its diversities, is still an organic whole; the condition of its being is the harmonic action of its parts. The mere fact of the enormously costly and cumbersome evolution of reason is guaranty of its biological value—of nature's sincerity in creating it for the whole organism. We all know the like value of the more ancient conative side of the mind. Have we not, then, warrant to suppose that the sapience of reason is vouchsafed for some better realization of those ideal satisfactions which the imagination so stoutly labors to supply? Certainly the fact that the chief category of our exact knowledge appears to be a direct specialization of the chief category of our imaginative, motivating, knowledge would seem to argue consistency in nature's intent.[4]

Such an interpretation might very possibly smooth over some philosophical antagonisms.

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REVIEWS AND ABSTRACTS OF LITERATURE

Yale Psychological Studies,[1] New Series, Vol. I., No. 1. *Monograph Supplement, Psychological Review,* Vol. VII., No. 1, March, 1905. New York: The Macmillan Company. Pp. 226.

The various papers on the different illusions report a very interesting

[4] If illustration be needed, the history of music is in point. Here the distinction of the quantitative, or mathematical, and the qualitative, or artistic, ideal of the study of sound, is as ancient as Aristoxenus and the Pythagoreans. As M. Le Dantec notes (*op. cit.*, p. 34), the two interests have developed wholly diverse languages, that of acoustics, that of musical art. "Ces deux langages sont exactement équivalents; l'un d'eux est plus complet que l'autre; par example n'importe quel bruit sera justiciable de l'analyse acoustique et pourra être reproduit par un phonographe, tandis qu'il sera impossible de le définir en langage musical. Le langage musical est limité à un certain nombre de sons choisis par les hommes d'après le plaisir qu'ils trouvaient à les entendre, et ayant par conséquent un rapport indéniable avec la nature humaine; notre gamme fait hurler les chiens." In other words, the exact, comprehensive language is that of acoustics, but the significant utterance is that of music proper. The ends of the latter are those for which both interests work; improved musical instruments follow the researches of Helmholtz and Lipps; broadened esthetic appreciation ensues upon the theories and achievements of Wagner.

[1] The contributions in the supplement are as follows: 'Introduction to a Series of Studies of Eye Movements by Means of Kinetoscopic Photographs,'

and successful attempt to photograph the movements of the eye in looking at the various lines. As a piece of psychological mechanism, the work done shows the greatest amount of thoroughness and care. The initial difficulty met with was the lack of any natural means of getting a fixed and identifiable spot on the eyeball which could be used for the pictures taken. The bright spot of the eye could not be used, since this is a variable quantity, changing with each rotation of the eyeball in its socket. To obviate this difficulty, a white spot was painted on the cornea by means of flaked Chinese white, the vehicle being paraffine. The head of the subject was supported by a device in the back, and by a 'bit' in the front, in the usual place, between the teeth. Iron spectacles, with shining steel beads on the lower rim for purposes of reference, were also worn by the subject. The photographs taken (at about the rate of eight per second) were then projected by lantern on a sheet of white. Since the iron spectacles with beads remained in the same place, the positions of the white spot in its wanderings were accurately marked and numbered as picture after picture was thrown on the screen.

In the photographs of the eye movements it is shown that in fixation of a point, the eye does not really fixate a point, but rather a small area. It goes round and about the point, the image of the point, therefore, taking position on various parts of the fovea. Another interesting fact brought out is that the two eyes are only approximately coordinate in fixation, or in passing over a line from one end to the other. In such passage, however, the eye is able accurately to follow a line from some given point to another. It might have been of interest to find what relation the area of fixation bears to the area of the fovea. It might be possible with the data in hand to determine whether the retinal area relative to fixation is the fovea, and whether fixation areas can be calculated for given distances of fixation.

Three papers in the monograph apply the method above described to the determination of eye movements in looking at the three given illusions. In the Müller-Lyer illusion, "the subject was directed to begin either at one of the extremes or at the middle where the obliques meet the horizontals, and to look across the figure in one direction and then back, and so on, fixating each time the three points of intersection of horizontals and obliques. This movement was to be made slowly enough to allow the subject to see the illusion clearly in the course of each inspection" (p. 55). The photographs show that the eye makes restricted movements in the underestimated part of the illusion, from which Judd concludes

by Charles H. Judd, Cloyd N. McAllister and W. M. Steele, pp. 1–16. 'The Fixation of Points in the Visual Field,' by Cloyd N. McAllister, pp. 17–53. 'The Müller-Lyer Illusion,' by Charles H. Judd, pp. 55–81. 'The Poggendorff Illusion,' by E. H. Cameron and W. H. Steele, pp. 83–111. 'The Zöllner Illusion,' by Charles H. Judd and Henry C. Courten, pp. 112–139. 'Analysis of Reaction Movements,' by Charles H. Judd, Cloyd N. McAllister and W. M. Steele, pp. 141–184. 'Practice Without Knowledge of Results,' by Charles H. Judd, pp. 185–198. 'Movement and Consciousness,' by Charles H. Judd, pp. 199–226.

that sensations of eye movements are not satisfactory as explanation of the illusion. The conclusion, however, can hardly be justified. As data for eye movements over an illusion, such movements being made under direction, the results are accurate and trustworthy. But as a study of illusion, they are hardly available. The restricted eye movements might be due to the inturned ends of the intersecting lines, to caution necessitated by small space, *such space being already seen,* and only partly fixated. Might it not be that (where the lines are not too long) the space is already seen, the smaller space hampering movement and so causing interruption? The underestimation may be the cause of the interruption instead of the reverse. *The illusion is seen before any extensive eye wandering has taken place,* and any eye movements occurring after the illusion is seen would be the results and not the causes.

In the experiments on the Poggendorff illusion, two of the five observers were asked simply to look back and forth over the presented figure. The results show most accurately the positions of the eye in following the line. It is shown that "the first portion of the movement conforms generally to the length and direction of that portion of the oblique line of the illusion over which it passes" (p. 102). The movement then shows a period of retardation and a significant change of direction. The movement then goes on uninterruptedly across the intervening space. There is then another series of pauses, after which the final stage is in the general direction of the oblique line. It seems highly probable, from the nature of the illusion, that these first movements determine the illusion, after which the movements may or may not be the cause. Since this illusion is one of direction, it seems to me that in this case, if the figure be not too small, some movement is necessary before the figure is seen in its entirety, and the nature of the movement brings about the illusion. The first (Müller-Lyer) and the last (Zöllner) illusions are rather ones of space.

In the Zöllner illusion tests, the observer was asked to look up and down all the long lines in any order he pleased, and asked to notice as carefully as possible the illusion. These movements are carefully plotted. In this illusion, as in the first, the illusion seems to exist before much movement has taken place. The movement, it seems to me, comes after the illusion exists, and seems to be an illusion partly of space, rather than of direction as is the Poggendorff. The plotting, it seems to me, shows not the movement giving rise to an illusion, but rather the curious investigation of an illusion already present. Exactly how much movement has already taken place at the moment the illusion stands out, would have to be determined, and all remaining movement would then be simply a result. A curious fact brought out is that the movement along the middle line is in a direction opposite to that in which the line appears to be deflected. Since, as stated in the paper, the habit of reading from left to right might be given as an explanation of the deflection, it would be interesting to see how the illusion influences those who read from right to left, or from the bottom up, and also how the deflection is seen by those who are unable to read, whether children or men.

As studies of eye movement under certain conditions, these experiments are worthy of the closest study, and should be carefully gone over by any one working in that line. But *as studies in illusion,* they are hardly available. Whether or not the angle explanation is valid, can not be determined by tests *with another means.* Even if the eye movements told us that the illusion depended on them, this would hardly shut out the angles as possible aiding causes. Where, as is highly probable, we have a mixture of effects, the methods of residues should be followed, and to determine the influence of the angles, the method of concomitant variations should be pursued *with the angles.* The authors, it appears to me, seem too anxious to be satisfied with simple explanations. It is possible by artificial means to produce eye movements similar to those made in looking at the illusion, without any angles being present. If, then, the illusion persisted, we might infer something from eye movement alone. The chief value of the experiments is their close connection with the sensori-motor theory of Dewey, and Judd himself recognizes this in his final paper on the relation of movement to consciousness.

In all these illusions, in addition to the photographic work done, a series of tests was carried on to find the effects of practice, which results are carefully plotted in curves. Mostly all the curves show a descent more or less steep. The general effect on the illusion is to bring about its disappearance.

The analysis of reaction movements deals chiefly with the antagonistic reaction in response to a stimulus after preparation. The method of reaction was of the 'press the button' kind. By a system of levers and springs the adjustments, vibrations, attitudes of the subject before and after the signal and stimulus were accurately recorded by means of a kymograph. "The records amply justify the statement that there is no such thing as a single reaction movement. Between the warning signal and the stimulus there is always a complex process of adjustment, and when the stimulus arrives, it finds the hand and the nervous system of the subject in some state of preparation which determines at once the way in which the reaction movement will be executed. There is no subject whose reactions are uniform or simple. Some are, indeed, more nearly uniform than others, but nearly every individual record shows complexity" (p. 163). The different types of reaction may be classified as the antagonistic, the wavy and the balanced. In the antagonistic reaction there is a general tendency on the part of the subject to prepare for the reaction by gradually or suddenly moving in the opposite direction. The wavy reaction seems to be due to a normal rhythmic tendency, the reaction being shorter when the tendency at its highest point coincides with the stimulus. The wavy line marked on the paper may be attributed to a general nervous rhythm. From this point of view, the level line would signify expressive activity, since it shows a rigidity in the subject due to an effort to overcome the natural rhythmic tendency. These various changes in movement between the signal and the stimulus, it seems, were made without any consciousness of them by their author.

A rather interesting series of experiments are recorded by Judd

showing the effects of habit without any knowledge of the fact that the habit was operating. A number of lines were drawn, some running up from left to right (+), and some down (—). A table was divided in two parts. On the left side, and in the field of vision were nine papers, one line on each. The right part of the table was out of the field of vision, being hidden by means of a screen. When a given line appeared, the subject was required, blindly, to put a dot at the place which he considered to be a continuation of the line, such dot being placed on the right-hand side. After a series of tests with the nine lines, it was found that no habit was formed, Judd concluding therefrom that this was due to the fact that there was no knowledge of results, and thus no motive for improvement. The corrective modifications due to knowledge of results were lacking. There is, however, another factor which seems to have been overlooked. The order of the lines given was, $-60°$, $-15°$, $\geq 45°$, $+15°$, $+60°$, $\pm 0°$, $+30°$, $-30°$, $+45°$. We have here a succession of conflicts which would operate strongly against the formation of any habit. With a single line a more rigid test could be made of this hypothesis.

A number of tests were then made with lines $+60°$ and $-45°$. The subject was allowed at intervals to pull aside the screen and to see at the same time the white paper on which he was to indicate the projection, and the paper having on it the line $+60°$, without moving his hand while looking. The new conditions operated by causing some variations in the results at first, but this error finally disappeared, and a habit for $+60°$ was formed. On the other hand, these conditions, favorable for $+60°$, operated against accuracy in the case of $-45°$. After a new series of tests with the nine lines as at first, the $+60°$ habit was evident. A series of further tests was then made to see to what extent the $+60°$ habit was effective. In a last series of experiments the subject was allowed to place his pencil in full view of both line and blank before doing it blind. This and other preceding tests were finally effective in disintegrating the $+60°$ habit. As the author states, these tests show conclusively that where results are unknown, a habit operates against positive reaction a different way, and is only modified where its misapplication is seen and understood. This, it seems to me, is a form of variation due to subjective peculiarities, and which is allowed for in the 'personal equation' in different fields.

In the final paper of the monograph, Judd tries to bind the preceding papers together by an examination of the relation of movement to consciousness. He criticizes Münsterberg's '*Aktionstheorie*' as not fully covering all cases of motor adjustment. He cites against the '*Aktionstheorie*' those cases of vivid consciousness in which action seems impossible just because no motor channels appear to be open, and inclines rather to McDougall's view that the vividness is due to the necessity of *opening* a motor channel. I do not think that Judd does full justice to Münsterberg's position. Action does not mean in its fullest intent, throwing a fit, for example, or standing on one's head. A motor tendency, an attitude or an alternation of attitudes, is sufficient, consciousness of such

attitudes giving us the vivid aspects of the present moment. Nor can the *opening* of a motor channel satisfy conditions, for this would carry us back to the cerebral psychology of the associationists, or to the misunderstood *'Innervationstheorie'* which has been discarded even by Wundt. The beginning of motor response to sensory stimulation would be nearer the truth. As Judd points out, Dewey has most adequately expressed the actual state of affairs by his 'sensori-motor' theory. "The sensation or conscious stimulus is not a thing or existence by itself; it is that phase of a coordination requiring attention because by reason of the conflict within the coordination, it is uncertain how to complete it." (Dewey, *Psy. Rev.*, 1896, p. 368, quoted by Judd, p. 202.) This sensori-motor theory is then examined in the light of the preceding experiments of the monograph and offered as a satisfactory explanation of them.

As a general suggestion in regard to the diagrams, tables and plates in this monograph, and also in other works, I offer the following: Could not each table, etc., have below a clearly printed set of explanations, etc., to facilitate reference? The constant reference back and forth is most confusing, and, as a matter of fact, most readers pass merrily by these tables, which are most laboriously gotten up for the purpose of elucidation. A proper set of explanations, directions, etc., clearly printed under each table, if necessary the whole thing occupying a separate page, would help the reader in getting the most out of them.

FELIX ARNOLD.

NEW YORK CITY.

An Introduction to the Theory of Mental and Social Measurements. EDWARD L. THORNDIKE, professor of educational psychology in Columbia University. New York, The Science Press. 1904. 8vo. Pp. xii + 212.

The few unimportant errors and omissions in this admirable book have been pointed out by various reviewers. I shall use the limited space that can be given to it here to speak of three particular excellencies, which make it the best introduction to statistical theory yet published, and a text-book that ought to mark an important departure in college training.

To begin with the simplest matters first, Professor Thorndike's more strictly practical chapters, on the arithmetic and algebra of the actual operations proper to statistical work, are marked not only by the simplicity and clearness of statement that are indispensable in such writing, but also by the ingenuity of a mind that has attained extraordinary cleverness in dealing with concrete cases. Students not altogether unfit for statistical work have had their difficulties with Bowley and Davenport. No student who can 'scrape through' the mathematics of his freshman year can fail to master Professor Thorndike's chapters on 'The Arithmetic of Calculating Central Tendencies and Variabilities,' 'The Transmutation of Measures by Relative Position into Terms of Units of Amount,' 'The Measurement of Differences and Changes,' and 'The Measurement of Relationships,' if he applies his mind to the task. These chapters alone would make Professor Thorndike's work more useful as a practical handbook in statistics than any other.

Of far greater importance, however, are the earlier chapters, setting forth the nature of statistical quantities, and, in particular, of mental and social measurements. Here, for the first time in the literature of statistics, we have a fairly adequate presentation of the difference between a full statistical statement in the form of tables and surfaces of frequency, on the one hand, and, on the other hand, condensed expressions, such as the average, the average deviation, the mode and the median. The full significance of this difference is brought out particularly well in chapter IV., on 'The Measurement of a Group.' The figures, 21 to 47, showing the actual distribution of measurements in a well-chosen variety of concrete subjects, are among the most instructive pages upon which the beginner in exact scientific research can spend his time. Not less commendation should be given to the pages on 'the interpretation of the form of a surface of frequency,' 'homogeneous and mixed groups,' and 'selected groups.' The reader who really masters the ideas conveyed by these pages will be well grounded in the fundamental notions of statistical thinking. He will be in no danger of mistaking the commonplace columns of undistributed figures that do duty for statistical 'reports,' for the real information that science calls for.

This admirable account of the actual distribution of frequencies in concrete cases leads naturally to a further discussion, that, namely, contained in chapter V., on 'The Causes of Variability and the Application of the Theory of Probability to Mental Measurements,' in which I find the third particular excellence of Professor Thorndike's work. He has seen clearly the important truth that when we have collected a great number of tables or surfaces of frequency we shall have so many, and such endlessly varied, departures from the 'normal' or 'probability' curve, that we shall perhaps no longer be justified in calling the probability curve normal in the sense of preponderatingly frequent for mental and social phenomena. His independent study of this subject has brought him to a certain conclusion which, although unobtrusively stated as a footnote on page 70, is in my judgment the most important paragraph in the book, and I therefore quote it:

> It is a question whether students of mental measurement should not from the beginning be taught to put the so-called normal distribution in its proper place as simply one amongst an endless number of possible distributions, each and all due to and explainable by the nature of the causes determining the variations in the trait. The frequency of the occurrence of distributions somewhat like it could then be explained by a *vera causa*, the frequency of certain sorts of causation. On general principles this seems desirable, but in order to make for the student connections with the common discussions of statistical theory and practice and with the concrete work that has been done with mental measurements, I have compromised and subordinated the general *rationale* of the form of distribution to the explanation of the probability curve type.

I believe that I am not wrong in thinking that this is a far sounder view than the one which students usually obtain from books like Jevons's 'Principles of Science' and Venn's 'Logic of Chance,' and it is in har-

mony with some of the later thinking of Karl Pearson and others, including Norton.

I can not leave this excellent book without making a pedagogical suggestion. If I had the making of the list of required studies in an American college course, I should put into it a term's drill in this book of Professor Thorndike's, whatever mathematical requirement I had to throw out to make place for it. Or, if necessary, I would substitute it for the required work in political economy; for it is a book that opens up, as nothing else ever has opened, the whole realm of scientific ideas and scientific methods in the so-called, but not really, inexact sciences.

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The Elements of Psychology. EDWARD L. THORNDIKE. New York: A. G. Seiler. 1905. Pp. xix + 351.

This is a book that will surely interest every teacher of psychology. The author is not only an original investigator of high standing and a clear and forceful writer, but he has done what few, if any, other psychologists of reputation, have done in writing a text-book, *i. e.,* thought more of the impression to be produced upon beginning students than of what his fellow psychologists may think about what he says. It is true that psychologists as such will find it a thoroughly scientific, up-to-date treatment of the subject in which the really important truths of psychology are emphasized, yet it is as a text-book for beginners that the work is especially important.

As a scientific work the chief characteristic to be noted is the prominence given to dynamic psychology, which occupies nearly half of the whole book. The treatment of descriptive and physiological psychology, though brief, includes all the essential elements. The biological and genetic point of view is prominent in all parts of the work. Unlearned and learned reactions to situations made possible by nerve connections is the basal thought of nearly all discussions of mental processes. The prominence given to instinct and habit and to the applications of the laws of habit to all kinds of mental operations and to various life situations makes the book a most excellent foundation for the science of education.

The chief point upon which the author presents a view opposed to the common one is regarding the images of movement sensations as initiators of movement. He holds that the stimulus to movement is usually an external situation or end, sensed or imaged, instead of an image of the subjective sensations that have been experienced in executing such a movement. With this view the reviewer is in sympathy. Unfortunately, in the preface, the author states the matter in a way that implies the more radical view that images of movement sensations *never* excite movement, and that this view is held by the reviewer and others. It seems to the writer clear, in all cases where the movement sensations are more important events in the mind of the actor than the objective results of the

motion, that images of the sensations experienced in such motions will be the chief excitants to subsequent movements of the same kind. Images of movement sensations are, therefore, probably the chief excitants of *some* movements in nearly every one and of *many* movements in the case of persons who are of the motor type.

As a text the most marked and valuable feature is the large number of exercises for students involving an application of what the student has learned, similar to that which the student of mathematics uses in working examples under the various rules he has learned. With very few exceptions these exercises are admirably well adapted to the purpose of making clearer, fixing and testing the knowledge that has been gained in studying the text. These exercises alone are enough to make every psychologist Dr. Thorndike's debtor.

Descriptions of experiments to be made, special topics to be studied and a selected list of references add greatly to the value of the book as a text, as do also indexes of illustrations and experiments in addition to the general index of names and subjects.

In the matter of illustrations, the book is incomparably superior to any other elementary psychology. Over half of the pages devoted to physiological psychology are partially or wholly covered with beautiful plates reproduced from the drawings of original investigators. Many students have a strong tendency to visualize mental processes and these plates will enable them to do so in a more rational way and at the same time to get a clearer idea of the nervous system and its physiology than a much larger space devoted to description could do.

Although the space devoted to classification and definition is much less than in the average text-book in psychology, yet the grouping of all these classifications in the first part of the book gives one at first the impression that classification is unduly emphasized—an impression later found to be wholly false. The classifications are enlivened and made effective by the exercises in classifying well-selected concrete examples. Pedagogically it is always undesirable to spend much time in classifying unfamiliar material, hence only the minimum of classification necessary for the student to proceed intelligently should be given at the start. The reviewer is, therefore, of the opinion that the classification of the 'Connection of Mental Facts' given on pages 12 and 13, however necessary to the author, will be an unnecessary burden and perhaps a source of confusion to the young student.

As a whole the book marks the greatest advance in the teaching of psychology that has been made since the publication of a psychology by Professor James (who, by the way, writes a very appreciative preface for this work). Professor James brought psychology down from the clouds, separated it from philosophy and showed it to be a part of life. Dr. Thorndike has made as distinct an advance in making the study of psychology educative material of a high order. He has made it forever impossible for writers of text-books in psychology to write as they have done, with little or no thought of the needs of students and teachers of

the subject. It would be absurd to say that he has made a text-book perfectly suited to all students and teachers of psychology, but it is perfectly safe to say that no other psychology has so many merits as a text for use in colleges and normal schools. A distinct advance in the teaching of psychology will surely result from the publication of this book.

E. A. KIRKPATRICK.

FITCHBURG, MASS.

Locke's Essay Concerning Human Understanding. MARY WHITON CALKINS. Chicago, The Open Court Publishing Company. 1905. Pp. xiii + 342.

To the valuable series of philosophical classics which the Religion of Science Library offers in inexpensive form there has been added a condensation of Locke's Essay by Miss Calkins. The editor's work has consisted primarily in the selection of the portions of the Essay to be printed, her purpose being to present the 'essentials of Locke's teachings in metaphysics and in psychology.' The first and third books, with the exception of the introductory chapter of the first, have been omitted, the former, 'because the innate-idea controversy is a dead issue' and the latter, 'because it deals with the logical and historical considerations.' The greater part of Book I. and a considerable portion of Book IV. have been retained.

Teachers of the history of philosophy who believe in putting their classes into the reading of the philosophers' own writings, and who at the same time seek to make such study contribute as directly as possible to present problems, will welcome this book with its judicious selection of materials.

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Le problème du génie. F. MENTRÉ. *Revue de Philosophie,* June, 1905. Vol. V., No. 6, pp. 649–682.

This is a review and criticism of Draghicesco's recent work, 'Du rôle de l'individu dans le déterminisme social.' The author of the latter attempts to resolve three connected antinomies: that of socialism and individualism (positive sociology and liberalism), of the individual and of society, of genius and the crowd. In treating the sociological conception of genius three methods are available: the first (Lombroso), the physiological, which studies the great man's heredity and temperament; the second (Séailles), the psychological, which attempts to bridge the gap between the genius and the ordinary man by exhibiting the gradations in mentality; the third (Draghicesco), the sociological, which places the genius in his environment and studies him in his social functions. In this last two groups appear: one (Emerson) exalts the heroes and conceives history as the work of great men; the other (Macaulay) lessens the rôle of the genius and emphasizes the collective achievements of obscure men. To resolve the antinomy between the school of the superman, that silhouette of genius, and the school of historic materialism, Draghicesco asserts that the mass forms the hero and the hero in his turn transforms the mass; both the individualistic and the collectivistic theses are needed to explain the formation and rôle of the great man, who

is at the same time a product and an agent. In its three classes the genius is a synthesis of the collective life: (1) the great general condenses in his person the merits of his subordinates, the statesman is an 'extract' of the social life; (2) the capitalist accumulates the product of the work of others, monopolizes the economic power of a mass of producers; (3) the inventor accumulates previous discoveries, the philosopher the speculations of centuries of thought, the artist the emotional life of an epoch. In brief, great men are not isolated figures: they appear only in great societies, and in periods of exceptional political and economical prosperity; they profit by anterior circumstances, birth, heritage and exceptional advantages. In fine, great men, generally fatalists, are conscious of a social determinism which operates in them and by them.

This collectivist view tends to a democratizing of genius which Mentré attacks as the author's weakest point. Society may suppress the eccentricities of great men (Baldwin), but it scarcely follows a gradual process of leveling down geniuses. Nor is genius merely a transitory phenomenon, intermediate between the primitive chaotic period (biological or prehistoric phase) when man was simply engaged in the satisfaction of his immediate wants, and the future (social or post-historic phase) when through a general diffusion of genius humanity shall calmly and methodically pursue the accomplishment of great designs. Such a philosophy of history is dubious in the light of the varieties of psychological endowments of social environment and the general complexity of human knowledge.

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JOURNALS AND NEW BOOKS

THE PHILOSOPHICAL REVIEW. May, 1905, Vol. XIV., No. 3. *Truth and Practice* (pp. 265–289): A. E. TAYLOR. – A careful and forcible exposition of the central error of pragmatism—the confusion of logical meaning with the psychological processes by which individuals become aware of logical meaning. *The Content and Validity of the Causal Law, II.* (pp. 290–307): BENNO ERDMANN.–"The connection between each definite cause and its effect is an empirically synthetic one. The necessity inherent in the causal connection demands only that there shall be something fundamental in the constantly preceding *a* which makes necessary the appearance of *b*; it does not inform us what this efficacy is, nor how it brings about the effect. Finally, every induction depends upon the presupposition that the same causes will be given in the reality not yet observed as in that already observed. This presupposition is not a necessity of thought." *Conceptual Completeness and Abstract Truth* (pp. 308–321): H. A. OVERSTRUT. – The author contends against the view that there can be no truth except in the light of the whole. He defends the Aristotelian conception of the irreducible uniqueness of the several categories, and undertakes to show that even the Hegelian dialectic is essentially a move-

ment of supplementation rather than of transformation, and that it is of such a nature that the lower categories remain absolutely true in their own partial spheres even after the higher categories are obtained. This is a very important refutation of the Bradleyan type of Hegelianism. *Pragmatism and its Critics* (pp. 322–343): A. W. MOORE. – An extremely lucid and temperate defense of pragmatism. The author urges the truth that the objectors to pragmatism persistently overlook the fact (1) that their definition of truth is realistic and dualistic, (2) that it is totally sundered from their criteria for detecting truth in all concrete cases. Reviews of Books: Rudolf Eucken, *Geistige Strömungen der Gegenwart:* A. C. ARMSTRONG. F. Pillon, *L'année philosophique:* G. M. DUNCAN. Hugo de Vries, *Species and Varieties:* E. G. SPAULDING. Notices of New Books. Summaries of Articles. Notes.

THE PHILOSOPHICAL REVIEW. July, 1905, Vol. XIV., No. 4. *Philosophy in the Nineteenth Century, I.* (pp. 403–428); G. T. LADD. – "(I.) A statement of the problems of philosophy as they were given over to the nineteenth century by the Kantian critique; (II.) a brief description of the lines of movement along which the attempts at the improved solution of these problems have proceeded, and of the principle influences contributory to these attempts." *Philosophy in France* (pp. 429–455): ANDRÉ LALANDE. – This article describes in a very interesting way, first, the organization of philosophy in France and its place in the curricula of the various colleges; second, the main tendencies of recent French philosophy in their relations to previous tendencies and to contemporary movements in other countries; third, the papers contributed by French philosophers to the international conference at Geneva. *Traité de l'infini crée* (pp. 456–471): NORMAN SMITH. – This article is the translation of a treatise probably written in the middle of the eighteenth century by the Cartesian philosopher and theologian, Abbé Jean Terrasson, and falsely ascribed to Malebranche. It argues for the infinity of the world of matter and spirits as evident in itself, and as a necessary implication of the infinitely infinite power and goodness of God. Reviews of Books: G. S. Fullerton, *A System of Metaphysics:* A. E. TAYLOR. James Rowland Angell, *Psychology: An Introductory Study of the Structure and Function of Human Consciousness:* FRANK THILLY. – G. Vorbrodt, *Beiträge zur religiösen psychologie:* GEORGE A. COE. Herbert Nichols, *A Treatise on Cosmology, Vol. I., Introduction:* E. A. SINGER. Notices of New Books. Summaries of Articles. Notes.

Calkins, Mary Whiton. *Der doppelte Standpunkt in der Psychologie.* Leipzig: Veit & Comp. 1905. 8vo. 80 pp. The volume may be obtained from C. A. Köhler, 149 Tremont St., Boston.

Couturat, L. *L'algebre de la logique.* Paris: 1905.

Del Vecchio, Giorgio. *I presupposti filosofici della nozione del diritto.* Bologna: Zanichelli. 1905. 8vo. 188 pp.

Eleutheropulos, A. *Das Schöne. Aesthetik auf das Allgemein-Menschlicke und das Künstlerbrewusstsein begrundet.* Berlin: Schwetschke & Son. 1905. 8vo. xv + 272 pp.

Franklin, Charles K. *The Socialization of Humanity;* a System of Monistic Philosophy. Chicago: Charles H. Kerr & Co. 1904. 8vo. viii + 481 pp.

Guastella, C. *Saggi sulla teoria della conoscenza; saggio secondo, filosofia della metafisica.* Palermo: Remo Sandron. 1905. Tomo I, 762 pp. Tomo II, 470 + appendice ccxxv + supplementi 349 pp.

Ranzoli. *Dizionario di Scienze filosofiche.* Milan: 1905.

NOTES AND NEWS

The Kantgesellschaft has announced the following conditions governing the prize which it has offered for the best essay on 'Kant's Conception of Knowledge Compared with that of Aristotle': (1) Time when essays are to be submitted, October 1, 1906. (2) The essays, marked 'Preisaufgabe der Kantgesellschaft' are to be sent to the Kuratorium, the University of Halle. (3) The announcement of the award will be made on Kant's birthday, April 22, 1907, at the general meeting of the 'Kantgesellschaft' in Halle. (4) The successful essay will receive the prize of 500 M. If the means of the Kantgesellschaft in 1907 allow, the amount of the prize may be increased and second and third prizes may be offered. (5) Every essay is to be signed with a motto. The name of the author is to be enclosed in a sealed envelop marked with the same motto and attached to the essay. (6) To every essay must be added an exact index of the literature used as well as a detailed table of contents. (7) Only plainly written MSS. will be accepted. It is recommended that MSS. be typewritten. (8) The essay may be written in German, English, French or Italian. (9) The judges of the contest will be: Geheimer Rat Professor Max Heinze of Leipzig, Hofrat Profesosr Dr. Alois Riehl and Professor Dr. Hans Vaihinger of Halle. (10) The editors of the *Kantstudien* are authorized, but not obliged, to publish the successful essay in their journal. Competitors for the prize need not be members of the Gesellschaft.

THE *Révue de Metaphysique et de Morale* for July, 1905, announces the death of Professor A. Hannequin, of the University of Lyons, and of the Abbe Charles Denis, editor of the *Annales de philosophie chretienne.* Professor Hannequin was among the first French philosophers to undertake the critical study of the concepts of science, which constituted, together with the history of science, his primary interest through life.

THE Libreria Editrice Lombarda, Milan, announces a series of translations which may have a certain value for readers of Italian. The present announcement comprises Novalis, Guyon, Plotinus, Meister Eckhart, Iacopone da Todi, S. Teresa, Orpheus and Jean Paul Richter.

THE council of the University of Liverpool has instituted a lectureship in experimental psychology. The work in psychology will, for the present, be carried on in the physiological laboratory.